ACCORDING TO IEC 60848

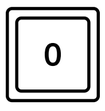
GRAFCET

Symbols and Rules

grafcet.io

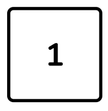
Draw and simulate GRAFCET online

STEPS, TRANSITIONS AND STRUCTURE



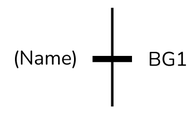
Initial Step

State of the control system immediately after start-up, shown with a double frame. Numbering is arbitrary, but “0” is common.



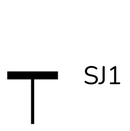
Step

Represents a state in the process. While a step is active, its associated actions are executed. Steps are numbered in ascending order.



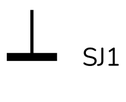
Transition

The transition condition is placed to the right of the transition. An optional transition name goes on the left. The preceding step is only deactivated once the transition condition is fulfilled.



Source Transition

Starts a GRAFCET without a preceding step.



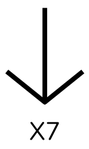
Sink Transition

Deactivates the preceding step without a following step.



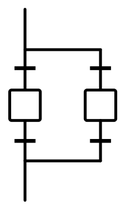
Feedback

The default flow direction in GRAFCET is from top to bottom. An upward arrow marks the feedback to an earlier step.



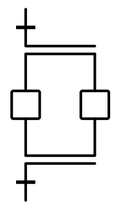
Jump

Jumps back to a previous step and is equivalent to a feedback connection. In this example, the jump leads to step 7.



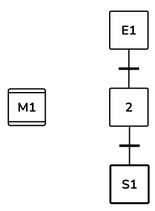
Alternative Branch

Splits the sequence into alternative paths. The transition conditions must be mutually exclusive. As a result, only one path is executed.



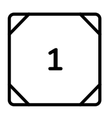
Parallel Branch

Splits the sequence into several partial sequences that run simultaneously. The sequence only continues once all partial sequences are completed.



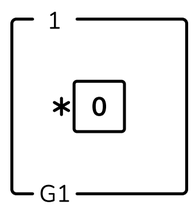
Macro-Step

Combines a sequence of steps and transitions. This sequence must be processed completely. The sequence starts with an E and ends with an S. The macro-step is labeled with an M.



Enclosing Step

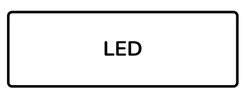
Encapsulates partial GRAFCETs. Activating the step activates its enclosures, deactivating it deactivates them. The step marked with an asterisk starts the partial GRAFCET.



Enclosure

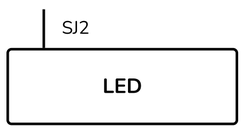
Frame for the partial GRAFCETs of an enclosing step. The number (here 1) and name (here G1) are placed on the left of the frame. An initial step is also permitted here.

ACTIONS AND ORDERS



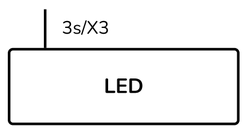
Continuous Action

The action is active as long as the associated step is active. As soon as the step is left, the action ends immediately.



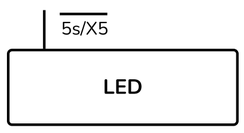
Continuous Action with Assignment Condition

The action is only active while the step is active and the additionally specified condition (SJ2) is fulfilled.



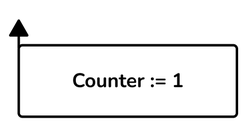
Delayed Action

The action only starts after the time specified to the left of the condition has elapsed and always ends with its step.



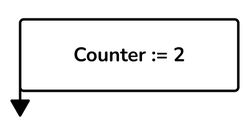
Time-Limited Action

The action starts immediately with the step and ends automatically after the specified time, even if the step remains active.



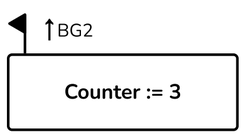
Stored Action on Activation

The variable is written when the step is activated and remains stored. The assignment uses “:=”.



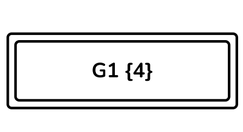
Stored Action on Deactivation

The variable is written when the step is deactivated and remains stored.



Stored Action on Event

The variable is written and stored as soon as the step is active and the event (here BG2) delivers a (here rising) edge.



Forcing Order

Forces another GRAFCET immediately into a defined state and overrides its logic. In this example, step 4 in enclosure G1 is activated.

“Comment text”

Comments

Comments improve the readability of a GRAFCET. They must be enclosed in quotation marks.

SYNTAX REFERENCE

Transition Syntax

BG1	Single condition (TRUE/FALSE)
BG1 · BG2	AND operation (entered as *)
BG1 + BG2	OR operation
$\overline{\text{BG1}}$	Negation (entered as !BG1)
(a + b) · c	Parentheses
↑BG1	Rising edge
↓BG1	Falling edge
5s/X1	On-delay (5 s after step 1)
BG1/3s	Off-delay (3 s after falling edge)
X1	Step query (is step 1 active?)
[C1<5]	Analog comparison in square brackets
1	Always true

Action Syntax

Motor	Continuous action: active while the step is active
K1 := 1	Set variable to 1
K1 := K1 + 1	Increment counter

Forcing Orders

G1 {}	Deactivate all steps in G1
G1 {4}	Activate only step 4 in G1
G1 {*}	Freeze the current situation, no further switching
G1 {INIT}	Initialize G1, the initial step becomes active

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